

Some *Pulvinaria* species (Homoptera: Coccidae) of the Ethiopian region

by

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INTRODUCTION

Two of the most important genera of Coccidae of the Ethiopian region have been almost fully described by De Lotto - *Coccus* (1957b, 1959) and *Saissetia* (1956, 1957a). His lead is here being followed, and this is the first of perhaps two papers attempting to redescribe the Ethiopian species of the genus *Pulvinaria* Targioni - Tozzetti, 1867.

Dealt with in this paper are three species which are obviously very closely related, *P. jacksoni* Newst., *P. crotonis* De Lotto and *P. inopheron* (Laing). However, it is felt that the differences are sufficient to keep them as separate species.

Recently two other species of *Pulvinaria* have been adequately described or redescribed from the Ethiopian region, and these are included in the key below; they are *P. iceryi* (Sig.) (Mamet, 1958), and *P. saccharia* De Lotto (De Lotto, 1964). A new species on *Uapaca* in Rhodesia is also described.

A key to some of the species of *Pulvinaria* found in the Ethiopian region.

1. At least five stigmatic spines per stigmatic cleft 4
- With only three stigmatic spines per stigmatic cleft 2
2. Dorsal disc pores just anterior to the anal plates present 3
- Dorsal disc pores just anterior to the anal plates absent **randiae**
3. Dorsal setae lanceolate 6
- Dorsal setae spinose 8
4. Small quadrilocular disc pores abundantly associated with the marginal spines **jacksoni**
- Small quadrilocular disc pores associated with the marginal spines few - less than one per spine 5
5. Second antennal segment as long as broad **inopheron**
- Second antennal segment twice as long as broad **crotonis**
6. Claw with small denticle **saccharia**
- Claw without denticle 7
7. Submarginal disc pores present **uapacae**
- Submarginal disc pores absent **iceryi**
8. Marginal setae strongly spinose **mesembryanthemi**
- Marginal setae fimbriate **vangueriae**

Pulvinaria crotonis De Lotto, 1954, fig. 1

This species was well described by De Lotto (1954), but a few points are made to clarify the differences between this species and *P. jacksoni* and *P. inopheron*.

The glands that De Lotto referred to as bilocular are figured as fig. 1A, and are here referred to as trilocular. The 'apparently granulated disc pores' are as shown in fig. 1C, and are to be found throughout the dorsum, though they are most frequent in front of the anal plates, and are here called granulated quadrilocular disc pores. Very small quadrilocular disc pores are also found throughout the dorsum, but are particularly associated with the marginal spines as in *P. jacksoni*, but much less frequently, averaging less than one free pore per marginal spine, i.e. those not touching the base of a marginal spine. There are between 55 and 65 marginal spines between the stigmatic clefts. Multilocular (6-8) disc pores are also found associated with the coxal attachments as in *P. jacksoni*. The structure of the ventral dermis is otherwise very similar to *P. jacksoni*, but the second segment of the antennae is much longer than it is broad (about $2 \times$).

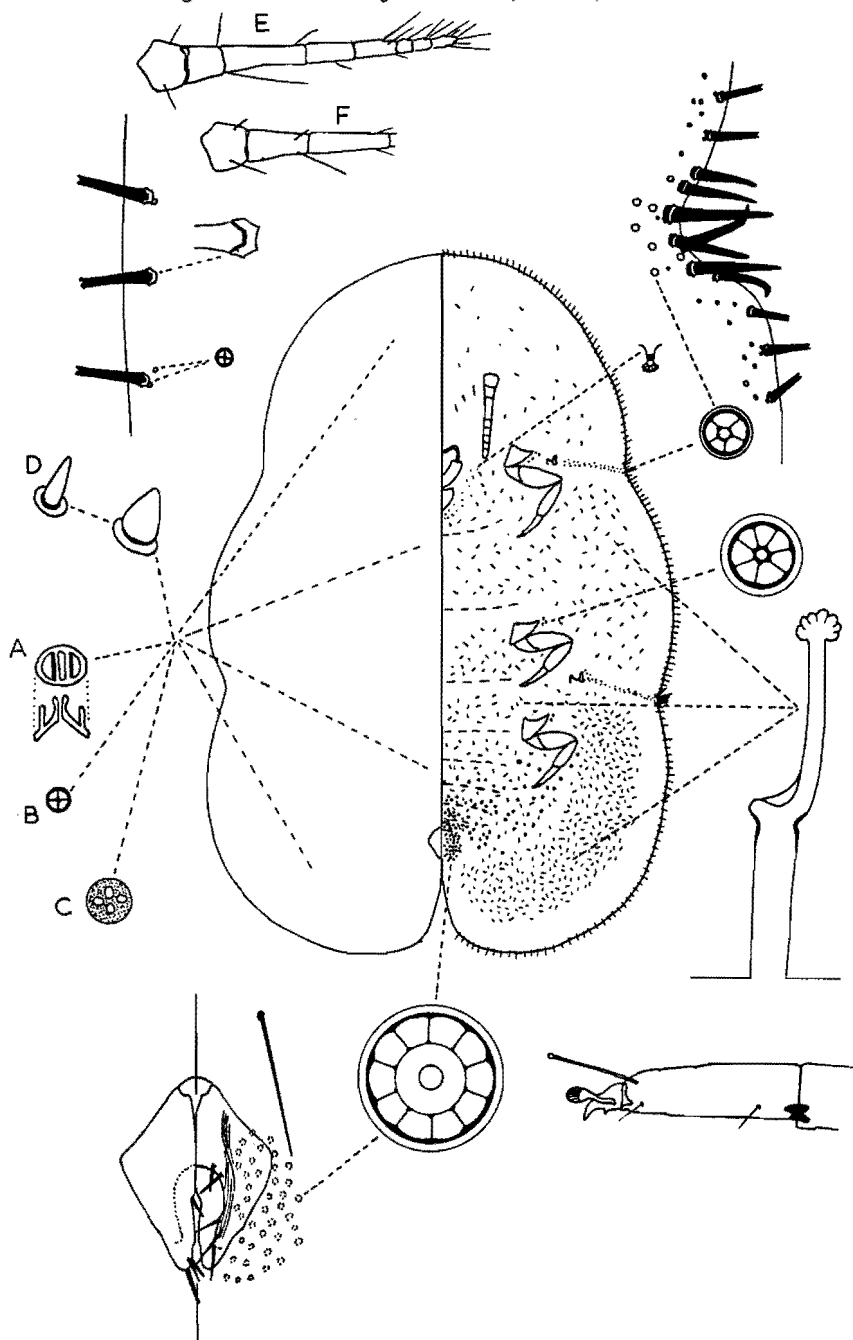
ERITREA: Ghescinascim, 4.III.1953, on *Croton macrostachys* (Euphorbiaceae), Dr. V. Nastasi, paratype.

For differences between *P. crotonis*, *P. jacksoni* and *P. inopheron* see under *P. inopheron*.

Pulvinaria jacksoni Newstead, 1908, fig. 1

Newstead's original description of the adult female at maturity: "Ovisac from two and a half to seven times the length of the female; breadth equal to the width of the insect; low convex, sides parallel, clearly felted, tough and web-like in texture. Length plus ovisac 16.75-42 mm."

Living material not seen, but mounted material is about 10 mm long and 7 mm wide. Body of the adult female fairly elongate but rather broad in the last third of the insect. The dorsal dermis remaining membranous at maturity, with no distinct areolation, and provided with small oval trilocular disc pores (fig. 1A); and numerous circular pores with a granulate surface, which appear to have four small loculi. These latter are most frequent in front of the anal plates, but are also found throughout the dorsum. Very small quadrilocular pores are also found throughout the dermis, and are also found in two rows around the perimeter associated with the marginal spines (fig. 1B). These average at least two per spine. Dorsal spines generally very stout, often as broad as long, but may be much thinner. Submarginal tubercles absent. The marginal spines are set fairly widely apart, and are robust with a bidentate end. There are between 35 and 45 between the stigmatic clefts. Associated with the base of many of these spines are one or more of the minute quadrilocular disc pores. Stigmatic clefts distinct, with six to twelve spines, which may be straight, but which are often curved, which are robust with rounded ends. They are very variable in length,



but the longest is about twice the length of the marginal spines. Anal plates about one and a third as long as broad, with three stout spines on the posterior tip, and another on the internal margin. Their surface appears to be roughened. Multilocular (10) disc pores are found abundantly around the genital opening, and on each of the abdominal segments, a little to one side of centre. Multilocular (6-8) disc pores also found in small numbers laterally to the base of each of the coxae. Quinquelocular disc pores present in a band about two pores wide between the spiracles and the stigmatic clefts. There are abundant tubular ducts found throughout the venter, but they are most abundant in a band behind the posterior stigmatic clefts. They are least frequent in the cephalic area. Another very small type of pore is found around the posterior part of the mouth, and much less frequently throughout the rest of the body. Spiracles without an oval spiracular plate. Antennae rather small, eight-segmented, with the second segment about as long as broad; claws with a small denticle. Supporting bars to the anal plates poorly developed.

RHODESIA: Zimbabwe, 13.VI.1937, on *Erythrina* species (Leguminosae), W. J. Hall; NIGERIA: Calabar, February 1907, on *Ficus* species (Moraceae), Jackson, paratype; KENYA: Nairobi 10.I.1955, on *Cassia dydimobotrya* (Leguminosae), De Lotto.

This species is very closely related to both *P. crotonis* and *P. inopheron*.

Pulvinaria inopheron (Laing, 1925), fig. 1

As was pointed out by De Lotto (1954), this species obviously belongs to this genus. (However see discussion at the end of the paper.) The ovisac is very long (up to 20 mm) and about the same width as the insect (2.5 mm). It is felted, though rather indistinctly, and often has a reddish tinge due to the larvae. The female is brownish and has a longitudinal central carina, is highly convex, and is about 5 mm long and 2.5 mm broad.

Slide material, apart from being rather smaller, is very similar to *P. jacksoni*, and so only an account of the differences will be given here. The dorsum differs from both *P. jacksoni* and *P. crotonis* in that the granulated quadrilocular disc pores found anterior to the anal plates are restricted to the area demarcated by the legs and antennae, and are not found laterally. The dorsal spines are highly variable as in *P. jacksoni*. The small quadrilocular disc pores are similar to those found in *P. crotonis*, and are found only in small numbers associated with the marginal spines as in *P. crotonis*. There are from five to nine stigmatic spines, and the number of marginal spines between the stigmatic clefts is between 35 and 50

EXPLANATION OF FIGURES

Fig. 1. *Pulvinaria crotonis* De Lotto, *inopheron* (Laing), *jacksoni* Newstead. 1A - Trilocular disc pores. 1B - Small quadrilocular disc pores. 1C - Granulated quadrilocular disc pores. 1D - Dorsal spine as in *P. crotonis*. 1E - Antennae of *P. crotonis* and *P. jacksoni* showing typical seg. 2. 1F. - Antenna of *P. inopheron*.

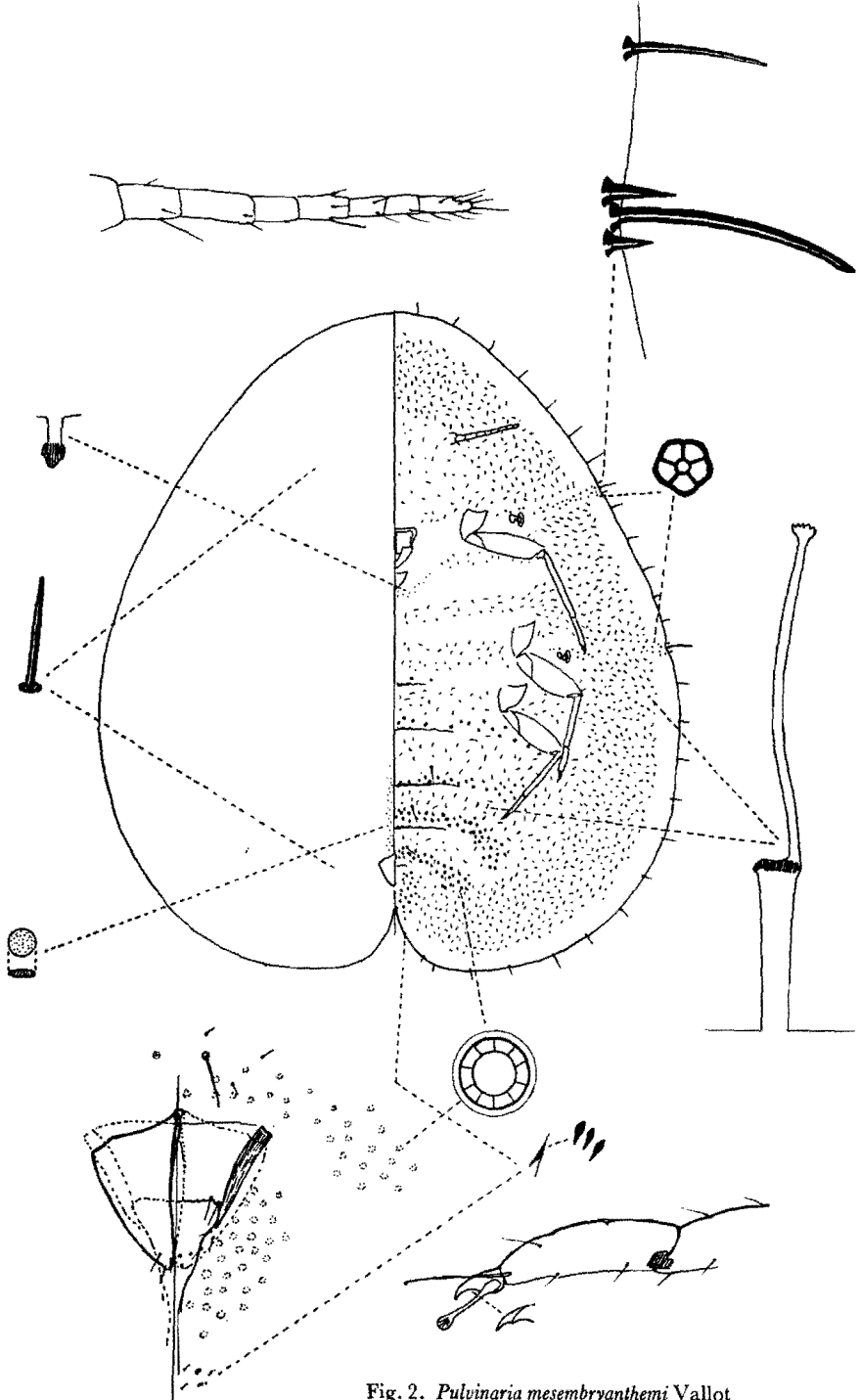


Fig. 2. *Pulvinaria mesembryanthemi* Vallot

The ventral surface is very similar to *P. jacksoni*, and the second segment of the antennae is about as long as broad.

RHODESIA: Salisbury, 30.VI.1938, on *Croton sylvaticus* (Euphorbiaceae), Coll. unknown; Salisbury 14.XI.1927, on *Croton sylvaticus*, W. J. Hall; Salisbury, 6.VI.1929, on *Croton sylvaticus*, W. J. Hall; Inyangombe Falls, Inyanga, 25.V.1964, on *Ficus* species (Moraceae), C. J. Hodgson; Inyangombe Falls, Inyanga, 25.V.1964, on *Cussonia spicata* (Araliaceae), C. J. Hodgson; Salisbury, October 1963, on *Hibiscus* species (Malvaceae), C. J. Hodgson; Umtali, August 1965, on *Hibiscus* species, C. J. Hodgson; UGANDA: Kampala, 30.I.1924, on *Erythrina* species (Leguminosae), H. Hargreaves, paratype.

Until quite recently, material from *Hibiscus* has been mistaken for *P. jacksoni* in this country.

The three species dealt with above are all remarkably similar, and only differ in a few important details. Both *P. jacksoni* and *P. crotonis* have the dorsal granular quadrilocular disc pores spread throughout the dorsum, whilst in *P. inopheron* they are restricted to the central area between the legs. *P. jacksoni* and *P. inopheron* both have the second segment of the antennae as long as broad, but in *P. crotonis* this segment is nearly twice as long as broad. In *P. jacksoni*, the minute quadrilocular disc pores are concentrated into two rows associated with the marginal spines, and these average out at about two to four free pores per spine - a free pore referring to those not touching a basal disc of a marginal spine, - but in *P. crotonis* and *P. inopheron* these are much less frequent, and are always less than one free pore per spine. The material mentioned by De Lotto (1954) in his discussion of *P. crotonis*, and which he considered to be *P. inopheron*, is in fact *P. jacksoni*.

Pulvinaria mesembryanthemi (Vallot, 1829), fig. 2

"Adult female to time of forming ovisac, and younger stages, green of the same tint as the fleshy leaf of *Mesembryanthemum edule*, its most common food plant; attaining a length of 5 mm, and an almost equal width. Moderately convex, dorsum smooth. As the ovisac is produced, the body of the female becomes yellowish and later yellow brown, much shrunken, with four transverse ridges and, ultimately, contorted or bent backward." (Brain, 1920).

The ovisac is pure white, rather featureless, convex and the female plus ovisac is rather shorter than twice the length of the female.

The mounted female is oval to heart-shaped, and barely sclerotized at maturity. The dorsal dermis has a few minute pores. Disc pores are present in front of the anal plates, and generally number between 50 and 60. There are no submarginal tubercles. The dorsal setae are bluntly spiniform. The marginal setae are few, rarely as many as ten between the stigmatic clefts. They are fairly long and spiniform. The stigmatic clefts are shallow, the median spine from four to six times the length of the two laterals, and about twice as long as the marginal

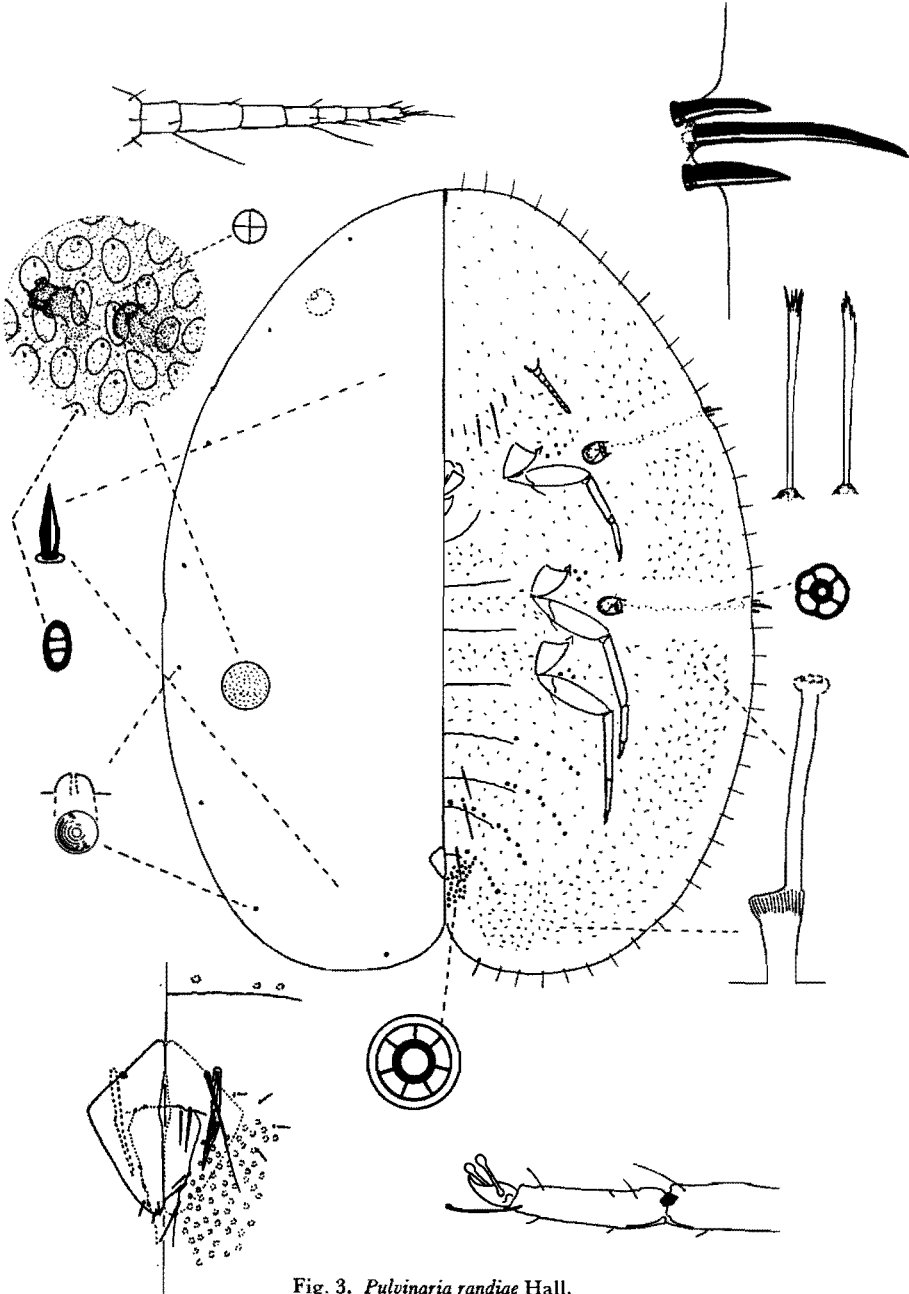


Fig. 3. *Pulvinaria randiae* Hall.

spines. Ventral dermis with multilocular (10) disc pores on each of the abdominal segments, and around the genital opening. There are none associated with the coxae. Quinquelocular disc pores in a rather wide band between the spiracles and the stigmatic clefts, and a few extending past the spiracles to the 1st and 2nd legs. Spiracles apparently lacking an oval spiracular plate. Tubular ducts present in a wide band around the margin, and less frequently medially. There are a few very small ducts just posterior to the mouth. Legs normal, with a tibio-tarsal articulation. Claw with a minute denticle. Antennae eight-segmented. The supporting bars to the anal plates well developed.

RHODESIA: Salisbury, 16.IX.1922, on *Mesembryanthemum* species (Aizoaceae), Mrs Huggins; Odzani, December 1964, on *Mesembryanthemum* species, C. J. Hodgson.

Pulvinaria randiae Hall, 1932, fig. 3

"Adult female broadly oval, very dark brownish green, almost black in colour. Dermis with a rather obscure median longitudinal carina which has little rugosities at more or less regular intervals along it. Dermis with a few similar rugosities irregularly spaced. Margin inclined to be somewhat upturned in older specimens. Ovisac broad, rather broader than the female, transversely striated and usually with a marked longitudinal groove, and a few obscure longitudinal striations. Surface of the ovisac not closely matted. Length of the adult female 4.5 mm; breadth 3.4 mm. Length of the adult plus ovisac 6.7 mm, breadth of ovisac 3.5-4.5 mm." (Hall, 1932).

Living or dried material not available. Mounted specimens oval in outline. Dorsal dermis at maturity sclerotized, and marked by numerous pale oval areas, each with a small trilocular pore. Small quadrilocular pores also present. Also some more heavily stained areas, which might be the small rugosities referred to above. Disc pores absent. Dorsal setae small, pointed and lanceolate, and rather sparse. Anal plates quadrate, a little longer than wide, and with three apical setae. Submarginal tubercles numbering about eight on each side. Eyespots present, but obscure. Setae of marginal fringe slightly fimbriate, few, about six or seven between the stigmatic clefts. Stigmatic spines stout and pointed, the median about twice the length of the laterals, and about the same length as the marginal setae. The sockets of the lateral stigmatic spines appear to be of a different type to that of the median spine, which is similar to the marginal setae. Abdomen with a few multilocular (7) disc pores. These are not very large and are clustered mostly around the genital opening. There are a few on the previous four segments, and a few (not generally more than four) are associated laterally with the base of the coxae. Quinquelocular pores in a band from the spiracle to the stigmatic spines, and about two pores wide. Spiracle with an oval spiracular plate. Tubular ducts found throughout, but much less frequent in the area of the head, and possibly absent from the area of the quinquelocular pores. Legs

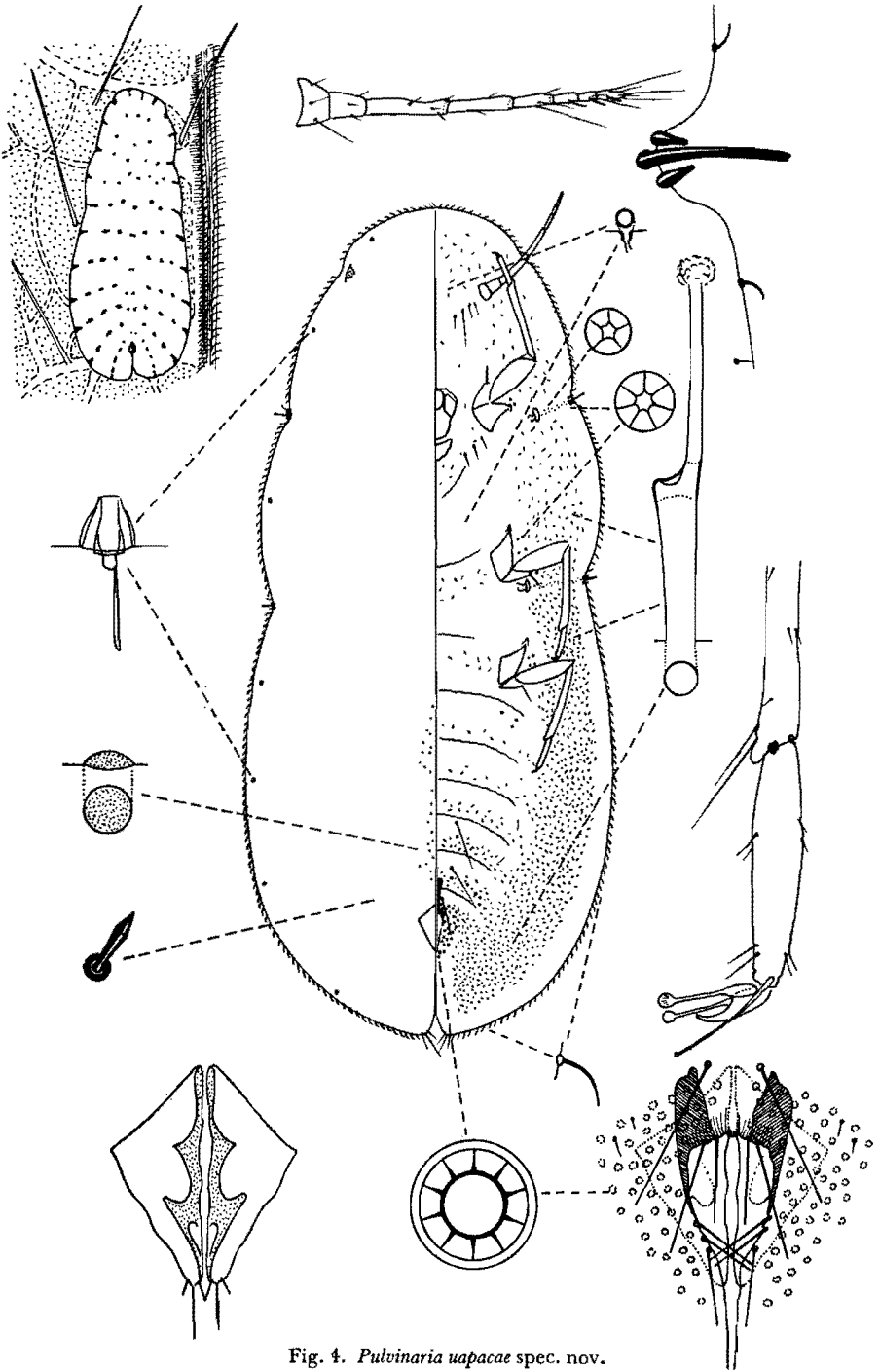


Fig. 4. *Pulvinaria uapacae* spec. nov.

well developed, with tibiotarsal articulatory sclerosis. Antennae with eight segments. Fold of anal invagination with four setae. The supporting bars to the anal plates not very strongly developed.

RHODESIA: Inyazura, 29.XI.1927, on *Xeromphis obovata* = (*Randia vestita*) (Rubiaceae), W. J. Hall.

Pulvinaria saccharia De Lotto, 1964

RHODESIA: Hippo Valley Estates, 19.II.1964, on *Saccharum officinarum* (Gramineae), A. J. Carnegie.

***Pulvinaria uapacae* spec. nov., fig. 4**

Although none of the specimens of this species showed any sign of an ovisac, the form and distribution of the various structures makes it certain that it must belong to this genus, and specimens with an ovisac will no doubt be found in the future.

Specimens in alcohol are up to 3.5 mm long and 1.25 mm wide. They are yellowish-green in colour, and have a series of brown marks on them as shown in figure 4. These may be arranged segmentally. As they grow on the leaf of their host plant, they get hemmed in by the plant hairs, and often become very deformed. The eye spots are distinct.

Mounted specimens are about the same size as above. They are very elongate oval, with three distinct indentations laterally, one for each stigmatic cleft, and another anteriorly for the eye-spot. The dorsum is not sclerotized, and has numerous small lanceolate spines, which do not appear to be arranged segmentally. There are between 30 and 40 granular disc pores in front of the anal plates, spread out thinly to between the posterior pair of legs. Submarginal pores present, about seven on each side, and of a structure similar to the small dorsal pores in *P. aristolochiae* Newst. The eye-spots are present and distinct. Anal plates quadrate, about one and a half times as long as broad, and with a characteristic thickening along the internal margins. There are three small setae on the posterior corners. Three stigmatic spines present, the median one about three times the length of the two laterals, and slightly curved. The marginal spines are rather small and distinctly curved posteriorly, except the one anterior to each stigmatic cleft which is curved anteriorly. Multilocular (10) disc pores present in large numbers around the genital opening, and in small numbers on the preceding two abdominal segments. They are also present on the first abdominal segment, and laterally to the coxal attachments. Quinquelocular disc pores present in a line about two pores wide between the spiracles and the stigmatic clefts. Tubular ducts present throughout the venter, most abundant laterally in the abdomen, becoming very scarce in the centre of the thorax, and in the cephalic region. Also present are very small tubular ducts with a sclerotized rim, which are found in the centre of the thorax and cephalic regions. Legs normal, femur rather wide, and the tibia rather long and thin. Tibiotarsal articulation present. Digitules of about the same length. Claws rather thin; no denticle present. Antennae with eight segments,

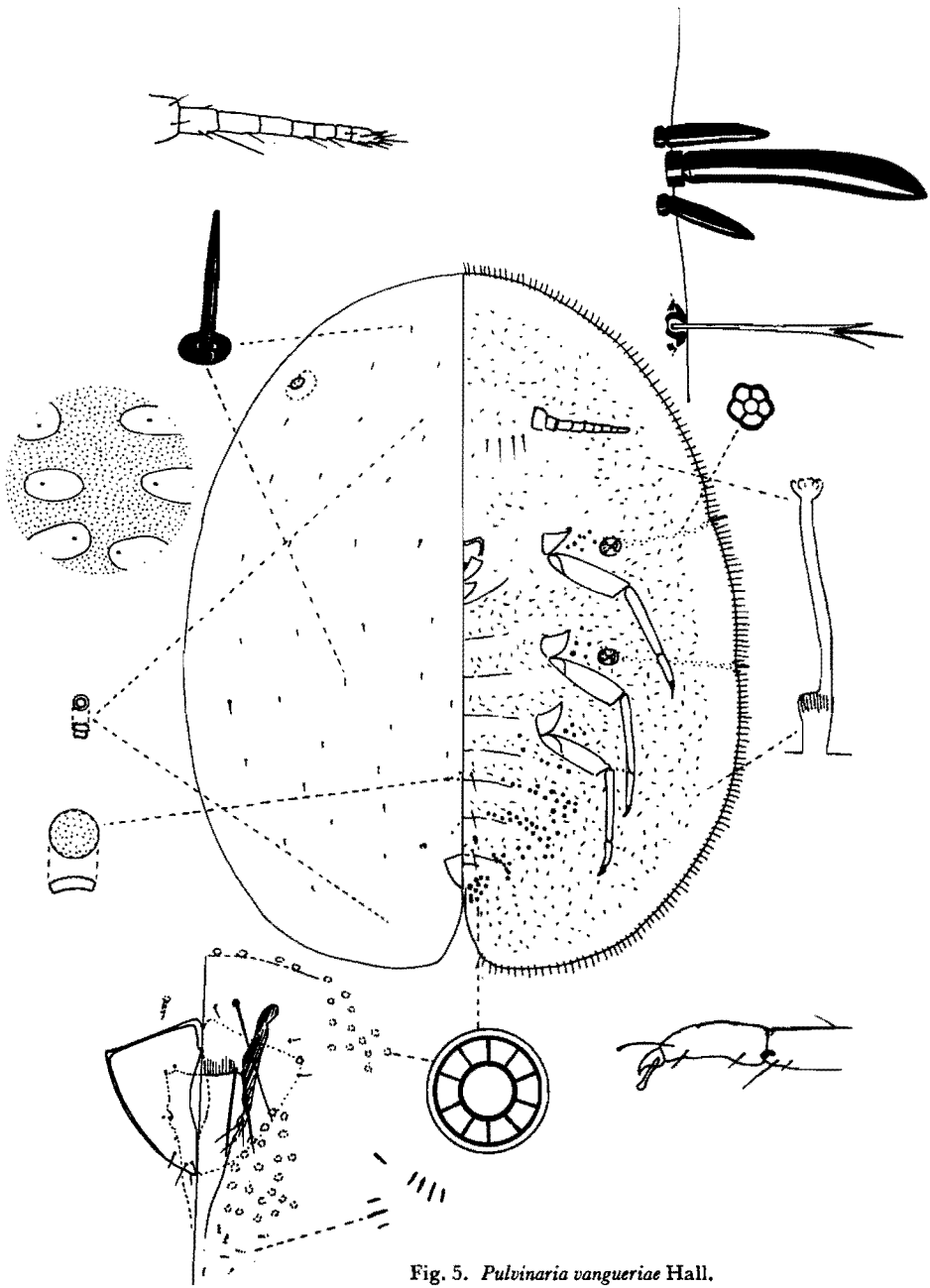


Fig. 5. *Pulvinaria vangueriae* Hall.

rather long and thin, the third and fourth segments at least four times their width. Fold of the anal invagination with four setae. Supporting bars to the anal plates large and well developed.

RHODESIA: Honde Valley, Inyanga, 11.VIII.1965, on *Uapaca Kirki-ana* (Euphorbiaceae), on the undersurface of the leaves, hard up against a large vein, C. J. Hodgson.

The ♀-holotype and four ♀-paratypes will be deposited in the National Collection of Insects, Pretoria; two paratypes in the collection of the Ministry of Agriculture, Salisbury, Rhodesia; two paratypes in the British Museum (Natural History), London; and two paratypes in the United States National Museum, Washington, D.C.

Pulvinaria vangueriae Hall, 1932, fig. 5

"Adult female very dark brownish-green, usually a pale yellowish-green around the margin. Ovisac highly convex, and in most cases with a well developed longitudinal striation, and others of a more obscure nature transversely. Eggs with a very faint tinge of green; young specimens green with a longitudinal median carina. All stages have a little crystalline matter scattered at intervals over the dermis. The margin is always markedly paler than the rest of the dermis. Length of the adult female prior to gestation 2.5 mm; breadth 1.8 mm. Length of the female plus ovisac 6.5 mm; breadth 2.5 mm." (Hall, 1932).

Living or dried material not available. Mounted specimens oval in outline. Dorsal dermis slightly sclerotized, and marked with numerous pale oval areas, each with a small pore. Disc pores present in a small group of three to eight in front of the anal plates. Dorsal setae sparse, but rather long and tapering to a blunt point. There were also a number of small sclerotized pores present throughout the dorsum. Anal plates quadrate, as broad as long, with the antero-lateral margin straight, and the posterolateral margin convex. There were four small apical setae. Submarginal tubercles absent. Eyespot present but obscure. Setae of the marginal fringe long and slightly frayed, and a little shorter than the median stigmatic spine. Stigmatic spines three, the median about twice as long as the two laterals, and tending to be thickest about three-quarters of the way up. The sockets of the stigmatic spines are different to those of the marginal setae. From 20-30 marginal setae between the anterior and posterior stigmatic clefts. Multilocular (10) disc pores present most commonly around the genital opening, and a little laterally of the centre in each of the abdominal segments. They are also generally found laterally to the coxae, though these are occasionally absent. Quinquelocular pores found between the spiracle and the stigmatic clefts, in a band about two pores wide. Spiracle with a non-sclerotized spiracular plate. Tubular ducts found throughout, most frequent in the marginal band. Fold of the anal invagination with four setae. Legs normal, with an articulatory sclerosis between the tibia and tarsus. Femur tending to be swollen distally. Antennae with eight segments, the segmentation being very indistinct in some cases. Supporting bars to the anal plates well developed.

RHODESIA: Mazoe, 7.XI.1928, on *Ficus* species (Moraceae), W. J. Hall;
Mazoe, 8.XII.1926, on *Vangueria* species (Rubiaceae), W. J. Hall.

DISCUSSION

It is obvious that under the present heading of the genus *Pulvinaria* there is a collection of species that differ very widely, and which will have to be put into a number of new genera when all the species from the Ethiopian area have been dealt with. The species discussed in this paper can be very easily divided into two groups, those with more than three stigmatic spines per stigmatic cleft, (e.g. *P. jacksoni* Newst., *P. crotonis* De Lotto and *P. inopheron* (Laing)), and those with only three spines. Associated with this difference are a number of others, all of which very readily distinguish this group from the rest mentioned in this paper.

De Lotto (1964) has already pointed out that another group of very closely related species is to be found in *P. saccharia* De Lotto, *P. tenuivalvata* (Newst.), *P. elongata* Newst., and *P. iceryi* (Sig.), and considers that these may have to be treated as a separate genus.

Borchsenius (1957) designated *mesembryanthemi* Vall. as type-species of his genus *Pulvinariella*. A translation of this paper is not available, but this decision could be justified, and merely emphasizes the heterogeneity of the species in this genus as recognized at present. No attempt has been made in this paper to follow this decision, which will be considered in a later paper.

SUMMARY

The author reviews or redescribes a number of species at present in the genus *Pulvinaria*. A key is given for the identification of the species mentioned in this paper.

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